Steven Bohon

North Carolina State University
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E-mail: srbohon@ncsu.edu
Mentor(s): Jessica Gaskin, PhD
Mentor Org: ZP12

Development of an Alignment Monitoring System for High Energy Replicated Optics Scientific Balloon Payload

The High Energy Replicated Optics for Exploring the Sun scientific balloon payload is a hard x-ray and solar imaging telescope that will be utilized for astrophysical and heliophysical research. We developed an optical alignment monitoring system that continuously monitors the alignment of both the x-ray focusing and x-ray detecting planes within the telescope optical bench as well as the alignment of the x-ray bench and co-aligned optical star camera positioning device in order to insure accuracy of in-flight data. Specific patterns of infrared light emitting diodes firmly mounted on the optical bench mirror and detector planes were imaged over time using a set of charge-coupled devices to determine misalignment of the mirror and detector planes due to twist or bend within the optical bench. The charge-coupled devices were rigidly mounted to the center plane of the optical bench in a thermally regulated structural enclosure. A second alignment monitoring system utilized a laser source on the optical bench mirror plane that was reflected from the optical bench center plane into the co-aligned star camera housing. From the star camera housing, the laser was reflected back to the center plane at a small angle to be focused onto an infrared filtered charge-coupled device. The system measured the deviation between the positioning device and the focus of the telescope. The laser source and charge-coupled device were fixed to the optical bench mirror plane within a thermally regulated structural enclosure. For both monitoring systems, the individual charge-coupled device output images were each compared to previous images using movement detection algorithms.

Research and Experience

- **Marshall Space Flight Center**, Summer Intern, Summer 2012
  High Energy X-Ray Branch: optical alignment monitoring system design; structural and thermal design for AMS hardware; structural and thermal redesign of optical star camera positioning device;
- **Gilbarco Veeder-Root,** Intern, Greensboro, NC Summer 2011
  Developed cold weather product solutions; designed and tested field-retrofit prototypes; developed competitive advantage prototypes for emerging markets;
- **Gilbarco Veeder-Root,** Intern, Greensboro, NC Summer 2010
  Collaborated with Indian partners in the building and testing of prototype units for a new line; performed quality analysis of field return production flow rate meters;

Memberships and Activities

Pi Tau Sigma International Mechanical Engineering Honor Society 2010-2012, University Honors Program NCSU 2008-2012

Honors, Awards

Dean's List 8 semesters, Engineering Foundation Merit Scholarship, Leon Memorial Scholarship